

REMARKS

By this amendment, claim 1 has been cancelled, claim 2 has been amended, and claims 3-16 have been added. Thus, claims 2-16 are now active in the application. Reexamination and reconsideration of the application is respectfully requested.

The specification and abstract have been carefully reviewed and revised to correct grammatical and idiomatic errors in order to aid the Examiner in further consideration of the application. The amendments to the specification and abstract are incorporated in the attached substitute specification and abstract. No new matter has been added.

Attached hereto is a marked-up version of the changes made to the specification and Abstract by the current amendment. The attachment is captioned "Version with markings to show changes made."

Applicant wishes to thank the Examiner for the kind indication in item 3 on page 2 of the Office Action that claim 2 is allowed. A minor grammatical correction has been made to claim 2, but the substance of claim 2 is unchanged.

In item 2 on page 2 of the Office Action, claim 1 was rejected under 35 U.S.C. 102(b) as being anticipated by Masubuchi (U.S. 6,051,768). This rejection is believed moot in view of the cancellation of claim 1. Furthermore, it is submitted that this rejection is clearly inapplicable to new claims 3-16, for the following reasons.

First, regarding independent claim 11 and dependent claims 12-16, it is noted that claim 11 is similar to original claim 2 in that it includes the limitation that "a yieldingly bendable curved hook is integrally connected to an upper side of said frame member, said curved hook having a nail formed at its free end;" as well as the limitation that "a panel engagement piece extends rearward from a rear side of said front panel, said panel engagement piece having an aperture therein, thus allowing said nail of said curved hook to fit in said aperture of said panel engagement piece when said curved hook is pushed against said panel engagement piece."

These limitations are clearly absent from the Masubuchi patent, and further, in view of the Examiner's statement of reasons for allowance, it is submitted that claim 11 is thus allowable

for the same reason as claim 2. Therefore, it is respectfully submitted that claim 11, as well as claims 12-16 which depend therefrom, are clearly allowable over the prior art.

Next, with exemplary reference to present Figs. 1-3, claim 3 sets forth a structure of an operation button unit arrangement, comprising: a cabinet structure including a front panel 22 and a bottom plate; an operation button unit 21 including an operation button 31, a unitary frame member 23 surrounding the operation button 31 and having a through-hole (see Fig. 2(c)) formed in an upper side, and a hinge 27 yieldingly fixing the operation button 31 to the unitary frame member 23 such that, upon a push being imparted to the operation button 31, the hinge 27 yields to allow the operation button 31 to be depressed relative to the unitary frame member 23; and a fastener (see Fig. 2(c)) inserted through the through-hole in the upper side of the unitary frame member 23 to fix the upper side of the unitary frame member 23 to the front panel 22; wherein the bottom plate of the cabinet structure has an engagement slot 34 formed therein; and wherein an engagement piece 33 extends downward from a bottom side of the unitary frame member 23 to be press-fitted in the engagement slot 34 of the bottom plate of the cabinet structure, whereby the unitary frame member 23 is fixed to the bottom plate of the cabinet structure by engagement of the engagement piece 33 in the engagement slot 34, and to the front panel 22 by the fastener (again, see Fig. 2(c)).

In contrast to the present invention as recited in claim 3, the Masubuchi patent discloses a keyboard assembly wherein a plurality of white keys 3 are swingably mounted to the lower case 16, and black keys 4 are swingly mounted to the lower case 16, in such a manner that the white keys 3 and black keys 4 are alternatingly arranged in the configuration of a keyboard. In broadly reading the Masubuchi patent on original claim 1, the Examiner took the position that elements 3 and 16 constitute a cabinet, elements 4a, 4b and 6 together constitute a frame, element 4 constitutes an operation button and element 9a constitutes an engagement piece engaged in a slot in a bottom plate of the cabinet. This reading of the Masubuchi patent is respectfully traversed and, in any event, is believed inapplicable to the present claim 3.

For example, claim 3 specifies that the operation button unit includes an operation button, and a unitary frame member surrounding the operation button. There is no corresponding structure in the Masubuchi patent. Also, it is not seen how the Examiner can properly consider the element 4a of Masubuchi to be a frame, and the element 4 of Masubuchi to be an operation button hinged to the frame 4a, since the element 4a of Masubuchi constitutes the body of the element 4 (see column 3, lines 31-35 of Masubuchi, "each black key 4 having a body 4a thereof connected to a black key support 6 via a black key connecting portion 4b ..."). As such, the Masubuchi arrangement clearly does not include an engagement piece that extends downward from a bottom side of the unitary frame member to be press-fitted in the engagement slot of the bottom plate of the cabinet structure, as required by claim 3. Also, as such, the Masubuchi arrangement does not include a hinge yieldingly fixing the operation button to the unitary frame member, such as required by claim 3.

Thus, for the above reasons, it is believed to be apparent that claim 3 is not anticipated by the Masubuchi patent. Furthermore, the above-mentioned differences are clearly such that a person of ordinary skill in the art would not have been motivated to modify the Masubuchi arrangement or to make any combination of the references of record in such a manner as to result in or otherwise render obvious the present invention of claim 3. Therefore, it is respectfully submitted that claim 3, as well as claims 4-10 which depend therefrom, are clearly allowable over the prior art of record.

The Examiner's attention is also directed to the dependent claims 4-10 which set forth additional features of the present invention and further define the invention over the prior art. For example, claim 4 recites a tapped boss 30 fixed to a rear side of the front panel 22, and specifies that the fastener comprises a threaded fastener inserted through the through-hole in the upper side of the unitary frame member 23 and screwed to the tapped boss 30. Claims 5 and 8 require the hinge 27 to be connected between the operation button 31 and a bottom side of the unitary frame member 23. Claims 6 and 9 specify that the engagement slot 34 comprises an engagement hole formed through the bottom plate of the cabinet structure. Claims 7 and 10

require the operation button 31 to be part of an operation button assembly 24, wherein the operation button assembly 24 further includes an upright base 25, with the operation button 31 projecting forward from the upright base 25, and an arm 26 connected to a rear side of the upright base 25 and extending rearward to press a switch 29 when a push is imparted to said operation button 31.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is earnestly solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, it is respectfully requested that the Examiner contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

Hidenobu MUKOUGAWA

By:

Charles R. Watts

Registration No. 33,142

Attorney for Applicant

CRW/asd
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
January 4, 2005

OPERATION BUTTON FIXING STRUCTURE OF ELECTRIC DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an operation button fixing structure of an electric device.

2. Related Art

[0002] Electric devices have buttons necessary for operation on their fronts. Such a button is operatively connected to a switch in the circuit board, so that when the button is depressed, it may make the associated switch turn on or off. The circuit board is mounted on the chassis of the electric device. When fixing the operation button to the front panel of the electric device, the operation button needs to be aligned with the switch, which is fixed to the circuit board. Exact alignment is required, and therefore there has been an ever-increasing demand for making it easy to fix operation buttons to the front panels in exact alignment with the associated switches.

[0003] To meet such demand JP7-141961(A) discloses an "Operation button Mounting Structure" where an operation button to be pressed has a hook piece integrally to be caught with its front panel of the cabinet and the front panel has a counter hook to catch the hook piece at its rear side. The operation button is fixedly held on the rear side of the front panel by engaging the hook of the button with the counter hook of the front panel. The operation button can be easily fixed to the front

panel, but it can be unhooked to come off from the front panel.

[0004] Fig.6 shows another conventional operation button fixing structure. As shown, an operation button unit 1 is fixed to the rear side of the front panel 2 of the cabinet. The front panel 2 has four tapped bosses 4 integrally connected to its rear side, and the operation button unit 1 is fastened to the four tapped bosses 4 by screwing the four corners of the a frame 3. Thus, the frame 3 is apart from the rear side of the front panel 2 by the distance equal to the length of the boss 4.

[0005] The operation button unit 1 has two button assemblies 5, 5 encircled by its frame 3, and each button assembly 5 is connected to the frame 3 via hinge 6. Each button assembly 5 has an arm 8 extending backwards until its free end comes to contact with an associated switch 10, which is mounted on a circuit board 9. When either button assembly 5 is depressed, its arm 8 inclines about the hinge 6 to push the associated switch 10 with its free end.

[0006] Fig.7a is a rear view of the front panel 2 having the operating button unit 1 mounted on its rear side; Fig.7b is a sectional view of the front panel-and-operation button combination taken along the line 7b-7b in Fig.7a; and Fig.7c is another sectional view of the front panel-and-operation button combination taken along the line 7c-7c in Fig.7a. As seen from these drawings, the frame 3 is screwed to the bosses 4, which project backwards from the rear side of the front panel 2. Each button 11 projects forward from the upright base piece 7 of the button assembly 5, passing through the hole 12 made in the front panel 2. As seen from Figs.7b and 7c, the button 11 partly appears from the front side of the front panel 2. With this arrangement, when the button 11 is depressed, the upright base piece 7 is yieldingly inclined about the hinge 6

to make the arm end contactscontact with the switch 10.

[0007] As the operation button unit 1 is screwed to the rear side of the front panel, it cannot come off from the front panel. The operation button, however, cannot be fixed to the front panel with ease. Fig.8 illustrates how the operation button 1 can be fixed to the rear side of the front panel 2, and how the circuit board 9 can be fixed to the bottom plate of the cabinet of the electric device. First, the operation button 1 is screwed to the front panel 2, and then, the circuit board 9 is fixed to the bottom plate (chassis). In the example shown in the drawing, four screws are used in fixing the operation button 1 to the front panel 2. The number of screws will increase with the increase in the number of the operation buttonbuttons to be fixed to the rear side of the front panel 2, and accordingly, the fixing work will be increasingly tedious. Further, the fixing work with use of screws will be more tedious and difficult in casewhen the space between the operation buttons and the bottom plate is so-narrow in suchan electric device such as a television.

[0008] In view of the above, one object of the present invention is to provide an operation button fixing structure which is capable of readily fixing an operation button to the front panel without fear of loosening and coming apart from the front panel.

SUMMARY OF THE INVENTION

[0009] To attain this object a structure for fixing an operation button unit to a rear side of a front panel of a cabinet of an electric device, the operation button unit comprising a frame and at least one operation button hinged to the frame, the hinge for fixing the operation button to the frame being responsive to a push given to the

operation button on the front side of the front panel for yieldingly bending, allowing the operation button to work, is improved according to the present invention in that the frame has at least one engagement piece extending downwards from the bottom side of the frame to be press-fitted into an associated engagement slot made in a bottom plate of the cabinet, and the front panel has at least one tapped boss fixed to its rear side, thereby allowing the frame to be screwed on the upper side to the tapped boss.

[0010] A structure for fixing an operation button unit to rear side of a front panel of a cabinet of an electric device, the operation button unit comprising a frame and at least one operation button hinged to the frame, the hinge for fixing the operation button to the frame being responsive to a push given to the operation button on the front side of the front panel for yieldingly bending, allowing the operation button to work, is improved according to the present invention in that the frame has at least one engagement piece integrally connected to and extending downwards from the bottom side of the frame to be press-fitted into an associated engagement slot made in a bottom plate of the cabinet, and the frame has at least one yieldingly bendable curved hook integrally connected to its upper side, the curved hook having a nail formed at its free end, and the front panel having an apertured engagement piece extending backwards from its rear side, thus allowing the nail of the curved hook to fit in the aperture of the engagement piece when the curved hook is pushed against the engagement piece.

[0011] Other objects and advantages of the present invention will be understood from the following description of two embodiments of the present invention, which are shown in accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING DRAWINGS

[0012] Fig.1 is a perspective view of an operation button fixing structure according to a first embodiment of the present invention;

Fig.2(a) is a rear view of the front panel having the operation button fixing structure attached to its rear side;

Fig.2b is a sectional view taken along the line 2(b) -2(b) in Fig.1;

Fig.2c is a sectional view taken along the line 2(c) -2(c) in Fig.1;

Fig.3 illustrates how the operation button unit can be fixed to the front panel;

Fig.4 is a perspective view of an operation button fixing structure according to a second embodiment of the present invention;

Fig.5 is a sectional view of the operation button fixing structure of Fig.4;

Fig.6 is a perspective view of a conventional operation button fixing structure;

Fig.7a is a rear view of the front panel having the conventional operation button fixing structure attached to its rear side;

Fig.7b is a sectional view taken along the line 7(b) – 7(b) in Fig.7a;

Fig.7c is another sectional view taken along the line 7(c) – 7(c) in Fig.7a; and

Fig.8 illustrates how the conventional operation button unit can be fixed to the front panel.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT EMBODIMENTS

[0013] Figs.1 to 3 shows a structure for fixing an operation button unit 21 to the rear side of the front panel 22 of the cabinet of an electric device according to the first embodiment of the present invention. The operation button unit 21 includes a frame

23 and two button assemblies 24, 24. Each button assembly 24 has an upright base 25, a button 31 extending forward from the front side of the upright base 25, and an arm 26 integrally connected to the rear side of the upright base 25, extending backward. The upright base 25 is connected integrally to the frame 23 via a hinge 27 (see Fig.2b). The button 31 is fitted in an associated hole 32 made in the front panel 22 to partly appear on the front side of the front panel 22, thus permitting access to the button assembly 24.

[0014] The cabinet has a circuit board 28 laid on its bottom plate, and the circuit board 28 has switches 29 mounted thereon. As seen from Fig.1, each arm 26 has its free end put on the associated switch 29. The structure of the operation button unit 21 described so far is the same as in Fig.6. The hinge 27 connecting the button assembly 24 to the frame 23 is responsive to a push given to the button assembly 24 on the front side of the front panel 22 for yieldingly bending, allowing the button assembly 24 to work on an associated switch 29 via its arm 26 for turning the switch 29 "on" or "off".

[0015] As seen from Figs. 2(b) and 2(c), the front panel 22 has tapped bosses 30 integrally connected to its rear side, and the frame 23 is screwed by its upper opposite corners, so that the button 31 projecting from its upright base pieces 25 may be inserted in the holes 32 made in the front panel 22. With this arrangement the hinge 27 will be yieldingly bent in response to depression of the button assembly 24, allowing the arm 26 to incline and push the associated switch 29 for turning the switch 29 "on" or "off".

[0016] As seen from Figs.2(a) and 2(b), the frame 23 has engagement pieces 33,

33 integrally connected to and extending downward from the bottom side of the frame

23. These engagement pieces 33, 33 can be press-fitted into associated engagement slots 34, 34, which are made in the bottom plate of the cabinet. As mentioned earlier, the frame 23 is screwed on the upper side to the tapped bosses 30.

[0017] Fig.3 illustrates the manner in which the operation button unit 21 and the circuit board 28 are fixed to the rear side of the front panel 22 and bottom plate of the cabinet respectively. First, the operation button unit 21 is readily fixed by screwing the upper, opposite corners of the frame 23 to the tapped bosses 30 and by press fitting the engagement pieces 33 into the slots 34. Then, the circuit board 28 is fixed to the bottom of the cabinet with its switches 29 aligned with the free ends of the arms 26, 26 of the operation button unit 21.

[0018] Fig.4 shows another embodiment of the present invention. The operation button unit 35 includes a rectangular frame 36 having two button assemblies 24, 24 hinged to its bottom side. Also, the frame 36 has two engagement pieces 37, 37 integrally connected to and extending downwards from its bottom side, and two yieldingly bendable curved hooks 38, 38 integrally connected to its upper side. The curved hook 38 has a nail 39 formed at its free end. The front panel 40 has apertured engagement pieces 41, 41 integrally connected to and extending backward from its rear side. Each engagement piece 41 has an aperture 42 made therein, thus allowing the nail 39 of the curved hook 38 to fit in the aperture 42 when the curved hook 38 is pushed against the engagement piece 41.

[0019] Each button assembly 24 has its upright base 25 connected to the frame 36 via the hinge 27. The upright base 25 has a button 31 and an arm 26 projecting

forward and backward respectively, as is the case with the first embodiment.

[0020] Fig.5 shows the operation button unit 35 as being fixed to the rear side of the front panel 40. As shown, it is fixed to the front panel 40 by allowing its hook nails 39, 39 to be caught in the apertures 42, 42 of the engagement pieces 41, 41, and at the same time, it is fixed to the bottom plate 43 by press-fitting its engagement pieces 37 into the slots 44, 44, which are made in the bottom plate 43. The hook 38 can be yieldingly bent to allow its nail 39 to fit in the aperture 42 of the engagement piece 41, so that the hook 38 may be resiliently held by the engagement piece 41 without the fear of loosing loosening.

[0021] When the operation button unit 35 is fixed, first, the nails 39, 39 of the curved hooks 38, 38 are inserted in the apertures 42, 42 of the engagement pieces 41, 41, and then, the engagement pieces 37, 37 of the frame 36 are inserted in the slots 44, 44 of the bottom plate 43 while the curved hooks 38 are yieldingly deformed.

[0022] As may be understood from the above, the operation button unit according to the present invention can be readily fixed to the rear side of the front panel and bottom plate of the cabinet of an electric device; the lower side of the operation button unit can be readily fixed to the bottom plate of the housing simply by inserting the engagement pieces of the frame into the slots made in the bottom plate. As for the first embodiment the upper side of the operation button are screwed to the front panel, which is much easier than screwing the lower side to the front panel. And, as for the second embodiment the upper part of the operation button unit can be fastened simply by inserting the curved hook into the aperture of the engagement piece projecting backward from the rear side of the front panel.

ABSTRACT OF THE DISCLOSURE

In order to facilitate fixing an operating button to the front panel of an electric device, the operation button includes a rectangular frame having at least one engagement piece integrally connected to and extending downwards from its bottom side. The operation button can be fixedly held on the lower side by press-fitting the engagement piece into an associated engagement slot made in the bottom plate of the cabinet. The front panel has at least one tapped boss fixed to its rear side, thereby allowing the frame to be screwed on the upper side to the tapped boss. Alternatively, the front panel has at least one apertured engagement piece fixed to its rear side, whereas the frame has at least one yieldingly bendable curved hook integrally connected to its upper side. The curved hook has a nail formed at its free end. The upper side of the operation button is fixed to the front panel by press-fitting the nail of the curved hook in the aperture of the engagement piece of the front panel.